

Dated: May 11, 1992.
Richard N. Smith,
Acting Director, Fish and Wildlife Service.
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50 CFR Part 17

RIN 1018-AB

Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for the Cave Crayfish *Cambarus aculabrum*

AGENCY: Fish and Wildlife Service,
Interior.

ACTION: Proposed rule.

SUMMARY: The Service proposes the cave crayfish *Cambarus aculabrum* (no common name) to be an endangered species under the authority of the Endangered Species Act (Act) of 1973, as amended. This freshwater crayfish is currently known from two caves in Benton County, Arkansas. Groundwater pollution represents the major threat to the species. This proposal, if made final, would implement the protection of the Act for *Cambarus aculabrum*. The Service seeks relevant data and comments from the public.

DATES: Comments from all interested parties must be received by July 27,

1992. Public hearing requests must be received by July 10, 1992.

ADDRESSES: Comments and materials concerning this proposal should be sent to Complex Field Supervisor, U.S. Fish and Wildlife Service, 6578 Dogwood View Parkway, suite A, Jackson, Mississippi 39213. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Paul Hartfield at the above address (telephone 601/965-4900 or FTS 490-4900).

SUPPLEMENTARY INFORMATION:

Background

Cambarus aculabrum was described from two cave streams in Benton County, Arkansas by H.H. Hobbs, Jr. and A.V. Brown (1987). It is a small, white, obligate cave-dwelling (troglobitic) crayfish with an overall body length reaching about 48 millimeters (1.8 inches). This species is distinguished from related surface species by a total lack of pigment, and by reduced eyes. It is distinguished from its closest troglobitic relatives by an acute or subacute apex of the anteromedian lobe of the epistome (mouthpart). First form males (those with fully formed and hardened first pleopods, or reproductive appendages) are further separated from the closely related troglobitic species, *Cambarus setosus* and *C. tartarus*, by the absence of a transverse groove separating the proximolateral lobe from the shaft on the first pleopod. It differs from first form males of another closely related cave species, *C. zophonastes*, by a longer central projection of the first pleopod which also has a shallow subapical notch (Hobbs and Brown 1987). Recent studies indicate that *Cambarus aculabrum* is genetically distinct from the other cave crayfish species (Koppelman 1990).

The type locality, Logan Cave, is an Ozarkian solution channel located in the Mississippian cherty-limestone Boone Formation of the Springfield Plateau (Hobbs and Brown 1987). A stream flows through the entire length of the cave, approximately 2000 meters (m) [6000 feet(ft)]. Logan Cave also contains a lake approximately 20 m (600 ft) long, 2-6 (6-13 ft) wide, and 2-3 m (6-9 ft) deep that was formed by the collapse of the cave roof. Water exits the cave approximately 300 m (900 ft) from the lake. *Cambarus aculabrum* is usually observed along the walls of the pool, or along the stream edges. Population numbers appear to be very small in Logan Cave. As many as six crayfish have been seen during one survey, but often none are evident (Hobbs and Brown 1987). In 14 visits to the cave, Brown observed crayfish on only three occasions (Brown *in litt.*, 1987). During a 1990 search of the cave lake and stream by Service biologists, only three *Cambarus aculabrum* were seen, one of which was dead. The U.S. Fish and Wildlife Service purchased 123.9 acres of Logan Cave, including the property that includes the cave's entrances, in 1989. The cave's recharge area covers 30.15 square kilometers (11.64 square miles), most of which is privately owned

(Aley and Aley 1987).

Cambarus aculabrum is also known from Bear Hollow Cave, located approximately 38 kilometers (23 miles) from Logan Cave. Bear Hollow Cave is also a solution tunnel in the Boone Formation and contains a small stream approximately 200 m (600 ft) long and 0.2 m (8 inches) deep (Hobbs and Brown 1987). Although there is less available habitat in Bear Hollow Cave than in Logan Cave, as many as nine crayfish have been seen during a single visit (Hobbs and Brown 1987). As in Logan Cave, however, numbers of crayfish observed may vary dramatically between visits. In the Service's 1990 survey, only a single crayfish was found in the Bear Hollow Cave stream. The extent of the Bear Hollow Cave recharge area is unknown. The cave's entrance and surrounding property are privately owned.

In general, very little is known about the ecology and natural history of cave crayfish, and only limited observations have been made of this species. First form males have been collected during the months of January, February, October and December. Female *C. aculabrum* carrying eggs and young have not been observed.

On July 15, 1988, the Service was petitioned by Dr. Arthur Brown, the University of Arkansas, to list *Cambarus aculabrum* as an endangered species. A finding of insufficient information to indicate the petitioned action was warranted was published by the Service in the **Federal Register** (53 FR 52745) on December 28, 1988. Recent cave crayfish surveys (Smith 1984, Figg and Lester 1990) and an electrophoretic investigation (Koppelman 1990) have supported the species' restricted distribution.

Summary of Factors Affecting the Species

Section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the cave crayfish *Cambarus aculabrum* are as follows:

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Water quality degradation represents the major threat to *Cambarus aculabrum*. Crayfish must have

dissolved oxygen in the water for respiration. Severe water contamination by sewage, animal waste, gasoline, or a number of other materials, results in seriously depleted oxygen concentrations and suffocation of cave crayfish. Contamination by toxic compounds, including heavy metals, many organic chemicals, and pesticides can destroy aquatic cave fauna, including crayfish. Sedimentation damages or destroys breeding habitat, and invertebrates upon which crayfish feed.

The discrete recharge area of Logan Cave has been delineated (Aley and Aley 1987), and the principal point sources of water contamination within the recharge area have been identified as poultry and hog operations. Using 1980 aerial photos, Aley and Aley identified 85 hog or poultry confinement areas adjacent to, or within the cave groundwater recharge area. Sixty-three of these pollution sources were in high to extremely high hazard areas (lands known or presumed to lie within the cave groundwater recharge area, or lands that contribute water exclusively to the cave spring). Since their study, one additional poultry operation has been constructed within a few hundred meters of the cave's sinkhole entrance, and a hog confinement area has become operational within one kilometer of the cave. The principal non-point source of water contamination identified by the Aley and Aley study (1987) was the use of liquid animal waste from the livestock operations to fertilize pasture lands in the Logan Cave recharge area. Runoff from improper applications of liquid waste, or heavy precipitation following applications, can rapidly enter the groundwater and result in oxygen depletion.

The Aley and Aley study (1987) also identified residential development as a potential source of water contamination in the Logan Cave aquifer. Although the Logan Cave recharge area is lightly populated at the present, 8 of 11 springs sampled indicated contamination by sewage. In view of the rapid population growth of Benton County, Arkansas, future residential land development represents a potential threat to Logan Cave water quality.

A well has been recently drilled in the immediate recharge area of Logan Cave for agricultural purposes. Water withdrawal through this well could effect flows in the cave during late summer low flow conditions. Exploitation of this portion of the aquifer for future agricultural expansion, commercial or residential development would significantly affect the cave stream flows and the cave crayfish.

The Arkansas Highway and Transportation Department's preferred route for relocation of U.S. State Highway 412 is through the Logan Cave recharge area. This would pose a threat to the Logan Cave population from construction activities, siltation, toxic spills, and highway runoff. An alternate route that would avoid the cave's recharge area has also been proposed.

Residential development is the primary threat to the Bear Hollow Cave crayfish population. Residential development may cause water quality degradation in caves due to leakage from sewage disposal systems and solid waste landfills, sedimentation, increased storm runoff, lawn fertilizers, herbicides, and pesticides. Residential growth also attracts secondary developments such as roads and gasoline stations which contribute to water quality degradation (Aley and Aley 1987).

Bear Hollow Cave lies on the northern edge of Bella Vista Village, a large retirement development. The cave entrance is a large sinkhole at the base of a ridge, and surface runoff in the vicinity of the cave drains into the sinkhole. The hills above the cave entrance have been subdivided for residential use, but many of the lots including those adjacent to the cave have not yet been developed. Currently, the population of Bella Vista Village is approximately 9000. Sewage disposal is by septic tanks. Although current impact to the cave aquifer is not known, the potential impact is significant. Over 36,000 lots have been sold in the community, including all of the lots in the subdivisions adjacent to, or in the vicinity of, Bear Hollow Cave, and the population is expected to increase by 1000/year into the foreseeable future (Jim Medin, General Manager, Property Owners Association, Bella Vista Village, Arkansas, pers. comm., 1990).

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.

The species is currently not of commercial value; however, albinistic cave species are often viewed as items of curiosity and intrigue. Bear Hollow Cave is heavily used by humans, as evidenced by a well-marked trail, extensive graffiti on the cave walls, and a large amount of litter inside the cave. The crayfish population of Bear Hollow Cave is subject to take from human curiosity and for aquarium pets. The entrances to Logan Cave have been purchased by the Service, and access is restricted.

C. Disease or Predation

Diseases are not known for cave crayfish. Predation of crayfish by the Ozark cavefish has been documented by Poulson (1961). The Ozark cavefish occurs in Logan Cave, but is not known from Bear Hollow Cave. Predation by naturally occurring predators is a normal aspect of the population dynamics of a species, and is not considered a threat to an otherwise healthy population of *Cambarus aculabrum*.

D. The Inadequacy of Existing Regulatory Mechanisms

Arkansas requires a scientific collecting permit for collecting any species, except taking for fish bait under other State regulations. Troglotic species are further protected from possession and sale by Arkansas State law. This affords very limited protection owing to the difficulty of apprehending violators and limited resources for law enforcement. The species is not recognized or protected by any other existing Federal or State regulation.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

The limited distribution of *Cambarus aculabrum*, with only two known populations, leaves the species vulnerable to localized environmental degradation. Population numbers in both caves are likely to be very small. The maximum number of crayfish observed from either cave at a single sighting has been 14. Small troglotic crayfish population size appears to result from food limitation in cave habitats (Culver 1982). Other adaptations that have been noted in cave crayfish and other troglotic species include lower metabolic rates, increased longevity, delayed maturity and reproduction, and decreased fecundity. One cave crayfish's life span has been estimated from 37 to 176 years, and sexual maturity was reached in 35 years on average (Culver 1982). The life span and other population parameters of *Cambarus aculabrum* are unknown, but it is likely they follow those known for other cave species. These characteristics would make the populations of *Cambarus aculabrum* more vulnerable to environmental pollution, bioaccumulation of toxins, and take, and limit the species ability to recovery from, or adapt to, environmental impacts.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in determining to propose this

rule. Based on this evaluation, the preferred action is to list the cave crayfish *Cambarus aculabrum* as endangered. Endangered status was chosen because of the species' limited distribution and the vulnerability and isolation of the only two known populations. Critical habitat is not proposed for reasons listed below.

Critical Habitat

Section 4(a)(3) of the Act, as amended, requires that, to the maximum extent prudent and determinable, the Secretary propose critical habitat at the time the species is proposed to be endangered or threatened. Section 7 of the Act requires Federal agencies to consult with the Service if any action they authorize, fund or conduct is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat, if designated. The Service's regulations (50 CFR 424.(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of such threat to the species; or, (2) such designation of critical habitat would not be beneficial to the species. The Service finds that designation of critical habitat is not presently prudent for this species for the reasons discussed below.

As discussed under Factor B, *Cambarus aculabrum* is an albinistic troglotic that is threatened by taking by novelty collectors or for aquarium pets. Such taking is difficult to enforce. Publication of critical habitat descriptions and maps in the *Federal Register* and local newspapers would make *Cambarus aculabrum* even more vulnerable and increase enforcement problems.

This species occupies a very limited range—2 caves. Water quality degradation represents the major threat to this species. Any contamination of the groundwater in proximity to the discharge areas can result in oxygen depletion in the cave water and would be likely to jeopardize the continued existence of the species. Therefore, the Service believes that habitat protection for this species will be best accomplished through the section 7 jeopardy standard and the section 9 prohibition against take. Thus, no appreciable benefits would accrue from critical habitat designation that would not also accrue from the listing of the species. All involved parties and principal landowners have been notified of the location and importance of

protecting this species' habitat. Protection will be addressed through the recovery process and through the section 7 jeopardy standard. Therefore, it would not now be prudent to designate critical habitat for *Cambarus aculabrum*.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify any designated critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal involvement is expected to include the Environmental Protection Agency through the Clean Water Act's provisions for pesticide registration and waste management actions. The Corps of Engineers will include this species in project planning and operation and during the permit review process. The Federal Highway Administration will consider impacts of bridge and road construction when known habitat may be impacted. Continuing urban development within the drainage basins may involve the Farmers Home

Administration and their loan programs. The Soil Conservation Service will consider the species under their farmer's assistance programs.

The Act and implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect; or to attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances. Regulations governing permits are at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. In some instances, permits may be issued for a specified time to relieve undue economic hardship that would be suffered if such relief were not available. Since this species is not in trade, no permits are expected.

Public Comments Solicited

The Service intends that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

- (1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to this species;
- (2) The location of any additional populations of this species and the reasons why any habitat should or should not be determined to be critical habitat as provided by Section 4 of the Act;
- (3) Additional information concerning the range, distribution, and population size of this species; and
- (4) Current or planned activities in the subject area and their possible impacts on this species.

Final promulgation of the regulation on this species will take into consideration the comments and any additional information received by the Service, and such communications may lead to a final regulation that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be received within 45 days of the date of publication of the proposal. Such requests must be in writing and addressed to the Complex Field Supervisor (see **ADDRESSES** section).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

- Aley, T., and C. Aley. 1987. Water quality protection studies, Logan Cave, Arkansas. Ozark Underground Laboratory. Report to Arkansas Game and Fish Commission, Pp. 1-2, 11-15.
- Culver, D.C. 1982. Cave Life (Evolution and Ecology). Harvard Univ. Press. Pp. 35, 51-54.
- Figg, D.E., and K.B. Lister. 1990. Status survey of the troglomorphic crayfish *Cambarus setosus* in Missouri. Missouri Department of Conservation. 7 pp.
- Hobbs, H.H., Jr., and A.V. Brown. 1987. A new troglomorphic crayfish from Northwestern Arkansas (Decapoda: Cambaridae). Proc. Biol. Soc. Wash. 100(4), pp. 1041-1048.
- Koppelman, J.B. 1990. A biochemical genetic analysis of troglomorphic crayfish (*Cambarus* spp.) in Missouri, Oklahoma and Arkansas. Report to Missouri Department of Conservation, Oklahoma Natural Heritage Inventory, and Arkansas Game and Fish Commission. 12 pp.
- Poulson, T.L. 1961. Cave adaptation in Amblyopsid fishes. Ph.D. dissertation, University of Michigan. Pp. 64-67.
- Smith, K.L. 1984. The status of *Cambarus zophonastes* Hobbs and Bedinger, an endemic cave crayfish from Arkansas. Arkansas Natural Heritage Commission, Little Rock, Arkansas. 15 pp.

Author

The primary author of this proposed rule is Paul D. Hartfield (see **ADDRESSES** section).

List of Subjects in 50 CFR Part 17

Endangered and threatened species,
Exports, Imports, Reporting and
recordkeeping requirements, and
Transportation.

Proposed Regulation Promulgation**PART 17—[AMENDED]**

Accordingly, it is hereby proposed to
amend part 17, subchapter B of chapter

I, title 50 of the Code of Federal
Regulations, as set forth below:

1. The authority citation for part 7
continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C.
1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–
625, 100 Stat. 3500, unless otherwise noted.

2. It is proposed to amend § 17.11(h)
for animals by adding the following, in
alphabetical order under Crustaceans, to

the List of Endangered and Threatened
Wildlife:

**§ 17.11 Endangered and threatened
wildlife.**

• • • • •
(h) • • •

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
•	•	•	•	•	•	•	•
Crustaceans	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
Crayfish (no common name).	<i>Cambarus aculabrum</i>	U.S.A (AR)	NA	E	NA	NA	NA
•	•	•	•	•	•	•	•